Conc Q #6,9,10
Problems Q #15, 31, 53, 57, 59

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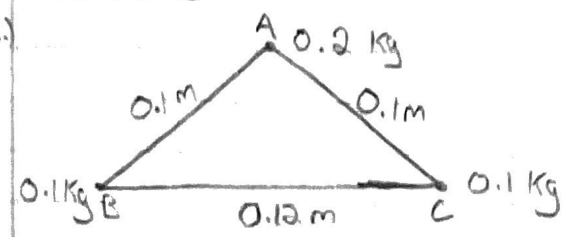
Ch 12 Homework
Problems

Taylor Larrechea

15.)



$$X_{cm} = \frac{0.1kg(0) + 0.2kg(0.06m) + 0.1kg(0.12m)}{0.4kg}$$

$$= \frac{0.012\ kg\,m + 0.012\ kg\,m}{0.4kg}$$

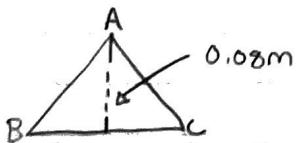
$X_{cm} = 0.06m$

$$y_{cm} = \frac{0.1kg(0m) + 0.1kg(0m) + 0.2kg(0.08m)}{(0.4kg)}$$

$y_{cm} = 0.04m$

A. $X_{cm} = 0.06m$ $Y_{cm} = 0.04m$
B. $I = 0.002\ kg \cdot m^2$
C. $I = 0.0013\ kg \cdot m^2$

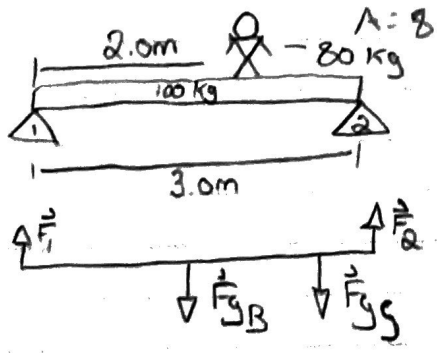
$I = m_B R_B^2 + m_C R_C^2$
$I = 0.1kg(0.1m)^2 + 0.1kg(0.1m)^2$
$I = 0.001\ kg\,m^2 + 0.001\ kg \cdot m^2$
$I = 0.002\ kg \cdot m^2$



$I = m_A R_A^2$
$I = (0.2)kg\ (0.08m)^2$
$I = 0.0013\ kg\,m^2$

$10^2 cm^2 = A^2 + 6^2 cm^2$
$100 cm^2 = A^2 + 36 cm^2$
$84 cm^2 = A^2$
$A = 8cm$

31.)



B= Board
S= Student

Downward

$F_{gB} = m_B g = 100kg(9.8m/s^2) = -980N$
$F_{gS} = m_S g = 80kg(9.8m/s^2) = -784N$

In equilibrium

$\vec{F}_{gB} + \vec{F}_{gS} + \vec{F}_1 + \vec{F}_2 = 0$
$F_{gB}R + F_{gS}R + F_1 R + F_2 R = 0$

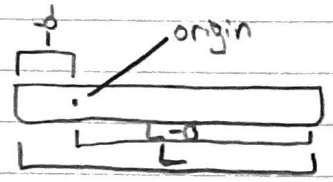
Pivot At 1

$-980N(1.5m) - 784N(2.0m) + 0 + \vec{F}_2(3.0m) = 0$
$-3038N + 3.0m\,\vec{F}_2 = 0$
$3.0m\,\vec{F}_2 = 3038N$
$\vec{F}_2 = 1013N$

$-980N - 784N + \vec{F}_1 + 1013N = 0$
$\vec{F}_1 + 1013N = 980N + 784N$
$\vec{F}_1 = 1764N - 1013N$
$\vec{F}_1 = 751N$

Board = -980N
Student = -784N
$\vec{F}_1 = 751N$
$\vec{F}_2 = 1013N$

53.)



"L" = Entire Length
"L-d" = Right side length
"-d" = Left side length

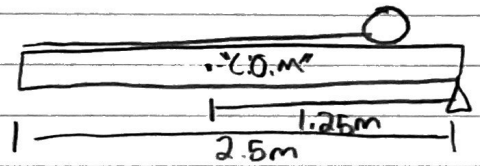
$$\frac{M}{L}\left[\int_{-d}^{0} r^2\,dm + \int_{0}^{L-d} r^2\,dm\right]$$

$$\frac{M}{L}\left[\frac{1}{3}r^3\Big|_{-d}^{0} + \frac{1}{3}r^3\Big|_{0}^{L-d}\right]$$

$$\frac{M}{L}\left[\frac{1}{3}d^3 + \frac{1}{3}(L-d)^3\right]$$

$$\frac{M}{3L} = d^3 + (L-d)^3$$

57.)



Woman = 60 kg
Board = 6.1 kg
Scale = 25 kg

$$M_B R_B + M_W R_W - M_S R_S = 0$$
$$6.1\,kg(1.25m) + 60\,kg(x) - 25\,kg(2.5m) = 0$$
$$7.625\,kg\,m + 60\,kg(x) = 62.5\,kg\,m$$
$$60\,kg(x) = 54.875\,kg\cdot m$$
$$x = 0.91m$$

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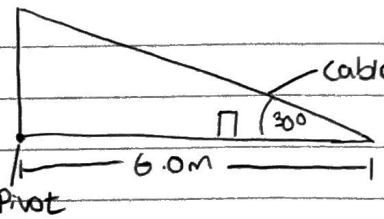
0.91m from pivot point

59.)



Beam = 1450 kg
Worker = 80 kg

$F_{G_B} = mg = 1450kg(9.8m/s^2) = -14,210N$
$F_{G_W} = mg = 80kg(9.8m/s^2) = -784N$

$F_G R = 3.0m$
$F_G W = 4.0m$

$$F_{G_B}^{(R)} + F_{G_W}^{(R)} + \vec{T}(R) = 0$$

$$\vec{T} = \vec{T}\sin 150$$
$$\theta = 150^\circ$$

$$-14,210N(8.0m) - 784N(4.0m) + \vec{T}(6.0m) = 0$$
$$\vec{T}\sin 150(6.0m) = 45,766\,N\,M$$
$$3m\vec{T} = 45,766\,Nm$$
$$\vec{T} = 15,255.3N$$

$\vec{T} = 15,255.3N$

Conceptual

6.) The Free Fall acceleration of planet 2 would be 10 m/s. The force of gravity is half that on planet 2 compared to planet 1.

$$\frac{GM(2m)}{(2)^2} = \frac{GM(2m)}{4} = \frac{GMm}{2} = GMm\frac{1}{2}$$

$$\frac{GM(1m)}{(1)^2} = \frac{GMm}{1} = GMm \cdot 1$$

9.) The correct answer would be C. Nothing changes in the Circular orbit equation since it is dependent upon the mass of the object it is orbiting, the gravity constant, and the radius of the orbit. Since Earth is moved out to the same radius as Jupiter, the orbital period is the same. It is not dependent on mass.

$$T^2 = \left(\frac{4\pi^2}{GM}\right) r^3$$

10.) $v = \sqrt{\frac{GM}{r}}$ wrong qushan.. 0/3

Since the radius of the orbit is decreasing, the fraction in the square root sign will be dividing by a smaller and smaller number as the radius decreases. "G" and "M" stay the same so the orbital velocity is increasing.